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ABSTRACT

Seychelles Integrated Science (SIS), a 3-year laboratory-based science program for students (ages 11-15) in upper primary grades 7, 8, and 9, was developed from an extensive evaluation and modification of previous P7-P9 materials. This P7 SIS unit focuses on: (1) the importance of water in students' daily lives; (2) the need to purify drinking water and how this is accomplished in Seychelles; (3) the development of skills in using a microscope and in performing simple separation techniques involved in filtration crystallization and distillation; and (4) the need for and methods of water conservation. Provided for the unit is a student workbook and a set of teaching notes. The teaching notes include the general aims of the unit and a lesson plan for each topic area. Each lesson plan includes a suggested time frame, a list of objectives, a list of equipment needed, and a suggested lesson format. This format includes suggestions for introducing the lesson, instructional strategies (emphasizing procedures for student activities), and evaluation methods. The student workbook includes procedures for completing the unit activities and a list of new words keyed to page numbers in the workbook. (JN)

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seychelles integrated science

Unit 3

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TEACHING NOTES

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Contents

The Goals of Unit 3 ..... Page 1

Topic 1 ..... " 2

Topic 2 ..... " 4

Topic 3 ..... " 7

Topic 4 ..... " 10

Project 1 ..... " 14

Topic 5 ..... " 16

Summary 1 ..... " 19

Topic 6 ..... " 21

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Goals of Unit 3

In Unit 3 we introduce the pupils to some of the basic properties of water - the most abundant chemical on the surface of the Earth. We develop the pupils' practical skills in the use of the microscope and in elementary separation techniques, skills which will be needed in later units of the SIS Programme and will also be important for any future study of chemistry. Wherever possible we have also related the content of each Topic to the pupils' own environment in Seychelles.

The Unit has four main goals :

(1) To foster in the pupils an awareness of the important role water plays in our everyday lives.

(2) To make the pupils aware of the need to purify drinking water and to develop their knowledge and understanding of how this is done in Seychelles.

(3) To develop in the pupils the practical skill required to

(i) use a microscope,
(ii) perform the simple separation techniques involved in filtration crystallization and distillation.

(4) To make the pupils aware of the need to conserve water and to develop their understanding of how this can be done.

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LESSON PLAN

Unit 3 Topic 1

Water, Water Everywhere

Time Three periods

Objectives At the end of the Topic the pupils should ;

(1) be able to recall three different "places" where we can find water, e.g. in the seas, in rivers and in ditches.

(2) be able to fold a filter paper and use it in a filter funnel to filter a sample of water with "dirt" in it.

(3) know that when we filter "dirty" water the water that passes through the filter paper is called the filtrate and that the material that remains on the paper is called the residue.

Equipment Each group of pupils will need

- three or four jars or beakers to collect water samples in,
- labels, or paper and tape to make labels with,
- a filter funnel
- a beaker to take the filtrate

EVERY pupil will need a filter paper.

SUGGESTED LESSON FORMAT

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Introduction Show the pupils a beaker of water and ask them what it is. After the pupils' first replies allow them a few minutes to talk with their partners to get a 'statement' to describe water. (Don't worry about

a text book definition but encourage the pupils to describe it in their own words).

Now ask the pupils to suggest some places where we can find water. Use the pupils' ideas to make a list of the places on the board (Objective 1).

Activity

Organize the pupils into groups. If possible allow each group to collect its own samples from four or five different locations, labelling them with their names, date and location. Collect a number of extra samples of river and ditch water. Back in the class room draw a (records) table on the board, similar to that on page 1 of the pupils' booklet.

Explain to the pupils exactly what you want them to do for each sample, e.g. feel it and write a few lines to describe the feel. Then smell it to see if it has a smell.

Explain to the pupils that they are going to clean some of the water by filtering it. Give out and let each pupil handle the filter funnel and filter papers.

Hold a filter paper up and demonstrate how to fold it. Get EVERY pupil to fold a piece of filter paper. You and the technician should check that everyone can do so (Objective 2).

Let each group read and carry out activity 1.4. Again you and the technician should move from group to group checking and helping.

Discussion and Evaluation

After the pupils have completed the filtration allow them a few minutes to discuss with you what they have done. From the discussion bring out the meaning of the words filtrate and residue. During the discussion write down the key words on the board and then ask the pupils to draw a picture and write a note in their own words about the activity. (Objective 3)

Move around from group to group checking on the objectiv

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LESSON PLAN

Unit 3 Topic 2

Using the Microscope

Time About three periods

Objectives At the end of the Topic the pupils should;

(1) know that a microscope is an instrument which helps us to see things which are too small for our eyes to see normally.

(2) be able to identify on a microscope or on a drawing of a microscope, the eye lens, the object lens, the mirror and the focus knob.

(3) be able to use a microscope to look at,

(a) writing on a thin sheet of paper,

(b) materials, such as living organisms or debris, in water.

Equipment Each group will need

- a microscope
- two microscope slides
- a sample of water with microbes in it @
- a teat dropper
- a beaker or jar
- a chinagraph pencil or label and tape

@ Plan ahead to make sure that you will have water samples with microbes in it, e.g from stagnant water in a ditch or marsh - but check that there are microbes present.

SUGGESTED LESSON FORMAT

Introduction

Show the pupils a microscope and ask them to say what it is and what it does. From their replies establish the word microscope and the idea that a microscope is an instrument which helps us to see things which are too small to see with our eyes alone (Objective 1).

Activity

Demonstrate to the pupils the correct way to caryy a microscope, i.e. with TWO hands, one under the base and the other around the arm.

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Get one pupil from each group to carry the group's microscope from the teacher's bench to their own bench. Point out on the microscope the eye lens, the object lens, the mirror and the focus knob and get the pupils to point these out on their microscopes (Objective 2).

Let all the pupils read page 3 carefully. With lower ability classes you may need to read out some of the passages yourself.

Discuss with the pupils each of the four stages in setting up a microscope. Then give every pupil in the class the opportunity to practice setting it up.

Let the pupils read Sections 2.2 and 2.3 . Then get one person from each group to write their name on a thin piece of paper (about 6 cm x 1 cm) and let EACH person in the group SET UP and adjust the microscope to look at the writing. Move around from group to group and ensure that everyone gets the opportunity to adjust and focus.

Let the pupils read Sections 2.5 and 2.6.
Ask them to take drops of water from their samples with the teat dropper and look at them under the miscroscope. With some samples they may need to take drops from near the bottom of their jars to get microbes. But make sure BEFOREHAND that you have samples which contain microbes.

Discussion and Evaluation

After all of the pupils have had the opportunity to look at the microbes, ask each group to prepare a verbal report on how to use a microscope.
After a few minutes let a few individuals explain how to use the microscope and get the rest of the class to judge if they are right.

Use these reports to write a list of rules for using the microscope on the board - as far as possible use the pupils own words.

Get the pupils to draw a large (half or full-page) drawing of a microscope and label it to show the eye& object lenses, the mirror and the focus knob Then let thepupils write down the rules for using the microscope into their books.

After the pupils have completed this let them read Section 2.7. Allow one or two to explain what they are going to do and then let each group set up the jar in preparation for Topic 4.

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LESSON PLAN

Unit 3 Topic 3

Drinking Water

Time three to four periods

Objectives At the end of the Topic the pupils should ;

(1) be able to explain in their own words why we need to 'treat' water before drinking it.

(2) be able to recall three important stages in the treatment of drinking water i.e. settling, filtering and adding chlorine.

(3) be able to explain in their own words that when water is stored in a reservoir some of the dirt in it will settle to the bottom as sediment

(4) Be able to make a simple filter column and use it to filter some ' dirty ' water.

(5) be able to explain in their own words that chlorine is added to water in order to kill the microbes in it.

Equipment Each group of pupils will need

- samples of water from Topics 1 and 2
- a teat dropper
- a squash bottle and scissors for cutting the bottle
- cotton wool, CLEAN sand, gravel and small stones
- some'dirty' water for filtering e.g. water with sand or humus in it.
- a beaker with 10ml of bleach
- a demonstration jar of 'settled'muddy water (e.g. from Topic 1)

You should also ensure that you have visual aids to help you explain the three stages in the treatment of drinking water. There may be slides available from the Science Centre. Also have a filter funnel ready for demonstration purposes and a bottle of bleach, e.g. Javel.

SUGGESTED LESSON FORMAT

Introduction

Revise the work the pupils did with the microscope in Topic 2. Allow them a few minutes to talk about and describe the microbes they saw. Show the pupils a beaker of water and tell them that this is the same water that they looked at through the microscopes. Ask if anyone would like to drink this water. Allow one or two pupils to explain why not. Then bring out the point that before we drink water we need to make sure that there are no microbes in it, or else the microbes could make us ill (Objective 1)

Activity

Explain that for this Topic you are going to look at the way the water authority 'treats' or purifies water for drinking. Let each group pour some 'brown' water - water with sand and humus (dead roots and leaves) will work best. Let the pupils watch this water for 4 - 5 minutes to see what happens. The show the class some beakers that you poured 'brown' water into earlier in the day (about 3 to 4 hours earlier or overnight). Ask the pupils to describe what they see and to explain what has happened. Allow each group a few minutes to discuss their suggestions and then let them report. In the discussion bring out the idea that most of our drinking water is stored in reservoirs and that in the reservoirs some of the dirt in the water will 'settle' to the bottom as 'sediment' (Objective 3).

Let the pupils read and then carry out 3.1. Allow the groups a few minutes to discuss their answers and bring

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out the point that the 'settled' water could still contain floating dirt and microbes. If possible show the class a sample of water with humus floating on the surface.

Show the pupils the filter funnel and use it to revise the word filtration. Explain that the water authority also filter out water but instead of using a glass filter funnel and paper they use 'filter beds' made of clean sand, stones and gravel.

Let the pupils read Section 3.2. Demonstrate how to make the filter column and then allow each group to make and test their own column (Objective 4).

Explain that the column filters almost all of the dirt and microbes from the water but that some microbes are so small that they can pass through the filter along with the water. So we have to add a chemical to the filtered water to make sure all the microbes are dead. This chemical is called chlorine. Let the pupils smell the chlorine and ask if anyone has every smelt it before. Some pupils may realize that bleach (Javel) contains chlorine. Show them a bottle and ask one pupil to 'read out' what is written on the bottle about treating water.

Let all the pupils now read and carry out Activity 3.3 (Objective 5).

Discussion and Evaluation

Ask the pupils if they can tell you three important things that the water authority does to treat our water so that we can drink it safely. Allow the groups a few minutes to prepare their statements. Then let one or two groups report. In the discussion bring out the three stages (Objective 2) but at the same time check on the pupils' understanding of the other objectives. Use the discussion to write a note or key word summary on the board. Finally ask the pupils to imagine that they are going to live on a small island and that they will need drinking water. Ask them to draw and label a picture of what they would do to 'treat' their water.

LESSON PLAN

Unit 3 — Topic 4

Some Solutions

Time — four to five periods

Objectives — At the end of the Topic the pupils should;

(1) know that we can kill microbes in water by boiling it.

(2) be able to carry out an experiment to show that sea water contains salt dissolved in it, given an evaporating basin, a tripod, gas burner and some sea water.

(3) be able to explain in their own words the meaning of the terms, dissolve, soluble, insoluble and solution.

(4) know that salt and sugar are soluble in water but sand and chalk are insoluble.

Equipment — Each group of pupils will need

- a microscope, two microscope slides and teat dropper
- an evaporating basin
- a tripod and burner
- some sea water (about 50 ml)
- two beakers (one for sea water and one for tap water)
- a spatula
- sodium chloride (table salt) about half a spatula.

- six test-tubes and a test-tube rack (if available)
- a selection of everyday substances, such as, sugar, salt, soap powder, chalk, sand, milk powder, coffee and curry powder.

You will need either an electric kettle or a beaker of boiling water and tripod, gauze and burner, AND a sample of water with living microbes in it.

SUGGESTED LESSON FORMAT

Introduction

Ask the pupils to look at the water level in the samples that they marked in Topic 2 (Activity 2.7) and to explain what has happened. In the discussion introduce the word evaporated (some of the water has turned into vapour). Put the beakers away and keep them for Summary 1.
Heat some water until it boils (in the kettle or beaker) and point out the 'vapour' or steam coming from the boiling water. Ask the pupils what will happen if you keep on heating the water - all of it will turn into vapour and the kettle or beaker will become dry.

Activity

Take half of the sample of water with microbes in it and boil it for 5 to 10 minutes. Meanwhile get each group to set up their microscopes and look at drops of water from the first half of the sample - the one in which the microbes are still alive. Make sure the pupils clean the teat dropper and then let them look at drops of water from the boiled sample. Discuss with the pupils what they have found out. In the discussion bring out the point that boiling water will kill the microbes in it (Objective 1)

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Let the pupils read Section 4.1 and 4.2. Allow each group a few minutes to discuss and explain to you

what they are going to do and then let them carry out the activity.

After each group completes the experiment ask them to prepare a report on what they did and what they found out. Let each group present its report to you individually (Objective 2).

After completing Activity 2 give each group the two beakers (one with salt water and the other with tap water). Get every pupil to compare the taste of the two by dipping their fingers into each and licking them. Ask the pupils can they see, smell, hear or touch the salt in the water. Then ask them to explain where the salt is. Allow a few pupils to present their ideas and in the discusion introduce the words DISSOLVE, SOLUBLE, INSOLUBLE and SOLUTION (Objective 3).

Let the pupils read and discuus Section 4.4 Get one group to explain to the class what they are going to do and ask the rest of the class to judge whether or not they are correct. When you are satisfied that everyone understands the instructions let the groups carry out the experiment .

Discussion and Evaluation

You and the technician should move around from group to group checking on their work and making sure that they understand the meaning of the words used in Objective 3. From your discussions get each group to identify salt and sugar as being soluble and sand and chalk as being insoluble in water (Objective 4). (At this level by soluble and insoluble we will mean soluble and insoluble in water).

Get each group to prepare a report on the experiment - using key words from the board if necessary and then let each pupil write up their own report.

You may also like to write a number of questions of the 'fill in the missing word' type on the board and ask the pupils to complete these in their books. For example,

"When we add salt to water we say the salt _____ in the water. This is because salt is _____ in water. When we add salt to water we make a _____ of salt and water. If we add sand to water it does not _____. This is because sand is _____ in water".

With faster working and more academically oriented pupils you should also have time to carry out activity 4.5 (b). Let the groups plan and discuss how they could find out if things dissolve 'better' in hot water than in cold water. When each group has discussed its plan with you let them carry out the activity.

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LESSON PLAN

Unit 3 **Project 1**

Making Crystals

Time One to two periods

Objectives At the end of the Project tne pupils should;

(1) be able, given a beaker, stirrer, burner and either magnesium sulphate OR copper sulphate powder, to make or grow crystals.

(2) know that crystals have regular shapes with straight edges.

(3) be able to draw a diagram of EITHER a crystal of magnesium sulhpahe OR of copper sulphate

Equipment Each group will need

- a beaker (100 or 250 ml)
- a stirring rod
- tripod,gauze,retort,boss head and clamp
- a gas burner
- about 15g of magnesium sulphate (or copper sulphate if this is not available)
- a crystallizing dish(or beaker if this is not available)
- a hand lens or magnifying glass

For demonstration you will need two 250 ml beakers, a tripod,gauze and burner, two stirring rods, a spatula and about 100 g of copper sulphate. Also ask the technician to prepare a number of crystals of other substances, for instance salt, sugar and alum.

SUGGESTED LESSON FORMAT

Introduction	Pupils who have carried out Activity 4.5 (b) will already know that many things dissolve more easily in hot water than in cold water - revise this idea with them. For classes who have not carried out this activity you may need to do a demonstration e.g. take two beakers, one with 100 ml of hot water in it, the other with 100 ml of cold water. Keep adding spatulas of copper sulphate in equal amounts to each and ask the pupils to judge if both dissolve the chemical equally well or if one dissolves it better that the other.
Activity	In the discussion bring out the point that more copper sulphate dissolved in the hot water. Let the pupils read Sections 1, 2 and 3. Give them a few minutes to discuss in their groups what they are going to do and allow each group to report to you individually. Then let them carry out the activity (Objective 1). You will need to wait until your next lesson with the class before the crystals will have grown.
Discussion and Evaluation	Let each group report on what they did. Use the reports to write a summary or outline on the board and then get everyone to write up their own reports. In the next period or lesson get each group to look at their crystals. Pick out the best and let them draw and label it (Objective 3). Pass around the crystals prepared by the technician. Ask the pupils to prepare a 'description' of a crystal. Allow a number to discuss their description with the class and from these bring out the idea that crystals have regular shapes and straight edges. (Objective 2)

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LESSON PLAN

Unit 3 Topic 5

Fresh Water From The Sea

Time Three to four periods

Objectives At the end of the Topic the pupils should be able to;

(1) explain in their own words
   (a) that when water boils some of it changes into vapour (steam) and that this process is called evaporation
   (b) that when water vapour is cooled down it condenses back into liquid water.

(2) recall that the process of evaporating a liquid and then condensing its vapour is called distillation.

(3) explain in their own words how sea water can be distilled in the laboratory using a beaker and evaporating basin.

(4) recall that distilled water is used in car batteries and in making some medicines because it is 'pure' water

(5) be able to explain in their own words how sea water can be purified for drinking on some of the smaller islands of Seychelles.

Equipment Each group of pupils will need
- a filter funnel and filter paper
- an evaporating basin
- two beakers (one 100 ml and one 250 ml)
- a tripod, gauze and gas burner
- about 100 ml of sea water

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For demonstration you will also need a distillation apparatus (See the diagram in pupils book page 12). If you do not have a condenser use the longest glass tube you have and cool it by pouring water over it. Make sure the none of this 'cooling' water runs into the collection beaker.

The demonstration will be more impressive and memorable for the pupils if you 'colour' the dirty water in the round bottom flask with some red or blue food dye.

SUGGESTED LESSON FORMAT

Introduction

Remind the pupils about Topic 3 - when you discussed how the water authority treated drinking water. Also remind them about their suggestions on how they would purify the water if they were going to live on a small island. Ask for suggestions about what they would do if they were to live on an island which had no rivers, streams or ponds. Encourage the pupils to bring out the idea of treating sea water.

Activity

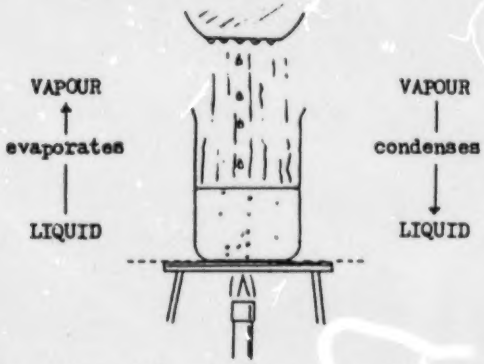
Give each group a filter funnel, filter paper, a clean beaker and a beaker with about 50 ml of sea water in it. Ask the pupils to filter the sea water. Get each pupil to dip their finger in and taste the filtered water. Ask the pupils if they can give you any suggestions about how we could purify the sea water.

After discussing a few ideas, let the pupils read Sections 5.0, 5.1 and 5.2. Allow a few minutes for each group to discuss what they will do and then let them carry out the activity. You and the technician should move from group to group getting the pupils to discuss and explain what they see and what they think is happening. Let each pupil use their finger tips to taste the distilled water they collect.

Let the whole class discuss what they think has

happened. From the discussion bring out the meaning of the words evaporation and condensation (Objective 1)

Sketch a diagram on the board,such as the one below;



Bring out the idea of the cyclic nature of evaporation and condensation. Get the pupils to draw it into their books and to write one or two sentances about the process.

Remind the pupils of the question you asked at the start of the Topic - how could we get drinking water from sea water. Ask if anyone could now suggest a way to do it (Objective 5)

Use the pupils' suggestions to lead on to the idea of distillation. Show the pupils the distillation apparatus. Explain how it works and then let them see you distilling some of the 'coloured' water. If possible let some of the pupils taste a little of the distilled water. (Objectives 2 and 3).

Discussion and Evaluation

Ask each group to WRITE a statement about distillation and what it means. Get one person from each group to report on their statement and allow some discussion about these. In the discussion bring out the point that we use distilled water in car batteries and in making some medicines because it is very pure water. (Objective 4)

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LESSON PLAN

Unit 3 — Summary 1

The Water Cycle

Time — One to two periods

Objectives — At the end of the lesson the pupils should;

(1) be able to explain in their own words that,
   (a) clouds are formed from water which has evaporated from the sea or the land,
   (b) rain is caused by water droplets in clouds joining together to form larger drops.

(2) be able to illustrate what is meant by the term water cycle by drawing a diagram depicting evaporation of water, clouds and rain.

(3) more academically oriented pupils should, given a diagram of the water cycle, be able to write a paragraph of 4 to 5 lines explaining what is depicted by the diagram.

Equipment — A good poster of the water cycle would be of great benefit in helping the pupils understand this Topic.

SUGGESTED LESSON FORMAT

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Introduction — Revise with the pupils the words evaporation and and condensation and then the cyclic nature of evaporation and condensation. Ask the pupils to look at the water levels of the samples they first set up in Section 2.7 of Topic 2 . Note that quite a lot of the water has evaporated.

Activity

Ask the pupils where did this water go to. Then ask if any of the water in the sea ever evaporates and if so where does it go. Allow the pupils a few minutes to discuss this and then let a few report to the class on their ideas. From the discussion bring out the idea that water from the sea and rivers evaporates and forms clouds.

Now ask the pupils what rain is and allow them to bring out the point that rain is this water vapour from the sea and rivers which has condensed (Objective 1).

Ask the pupils to draw a diagram to show this idea of where rain comes from. You and the technician should move around checking on the pupils' work.

Discussion and Evaluation

Show your poster - or use the pupils' diagrams to draw a labelled summary on the board. Discuss it with the pupils and then let the pupils read page 13 in their booklets (Objective 2)

With more academically oriented pupils you should also get them to write a paragraph of about 4 to 5 lines explaining the whole process of the water cycle (Objective 3).

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LESSON PLAN

Unit 3 Topic 6

Saving Water

Time About two periods

Objectives At the end of the Topic the pupils should;

(1) be able to recall 5 ways in which we use water in everyday life

(2) given a chart of how much water we use for different purposes, be able to interpret it to identify which of six activities use most water and which use least.

(3) know that in Seychelles we pay for water according to the amount we use and that the more water we use the more we have to pay.

(4) Given the cost of 1 unit of water and the present and previous readings on a water metre, be able to calculate the cost of up to 10 units of water.

(5) be able to explain in their own words at least two ways in which we can 'save' water during the dry season.

Equipment Each pupil or pair of pupils will need

- paper for a poster
- some felt tip pens, crayons or coloured markers

You should also check with the Science Centre to see if they have a slide set or video available for this Topic.

SUGGESTED LESSON FORMAT

Introduction

Ask the pupils if any of them have taken a drink of water today. Talk with the pupils who say that they havn't and bring out the point that everything we drink is made mainly of water - lemonade, squash, tea, coffee etc.

Activity

Ask each pupil to work with a partner to write down a list of the different ways we use water. Drinking is one way ...ask how many other ways they can think of. Allow each pair some time for preparing their list and then use their suggestions to make a list on the board. Ask the pupils to explain how water is used in each of the ways listed (Objective 1).

Ask the pupils to say which of the uses listed on the board do they think will use most water. Let them give a reason for their suggestions. Then let everyone read Sections 6.0 and 6.1.

Sketch the chart on the board - use different coloured chalks if possible- and explain what each section of the chart means. Ask the pupils to pick out the 'way' which uses most water and the way which uses least. (Objective 2).

Ask the pupils if anyone has ever seen a water bill. Ask someone to explain what it is and from the explanation bring out the point that the more water we use the more we have to pay (Objective 3).

Draw the 'water bill'(on page 14) on the board with different present and previous readings (we suggest present = 55, previous = 50). Ask the pupils how many units were used. Then ask them what would be the cost if 1 unit of water cost 1 Rupee. Give the pupils a number of examples to work out. Suit these to the level of your class. Check their work as they do these examples (Objective 4).

Discussion and Evaluation

Revise the different uses we make of water and bring out again which uses most and which uses least water. Make the point that if we don't have much rain then it will be very important to save water, especially during the dry season. Ask the pupils to work in groups to think of ways we could save water. Let each group report on their ideas and make a list of the best ideas on the board. (Objective 5).

Give out the poster paper and markers or paints and ask each group to design and prepare a poster which could be used in a campaign to save water.

When the pupils have finished let the class help you select the best three. Send these to the Science Section of NIE - via the Floating Technician. We will arrange a prize for the best poster we receive.

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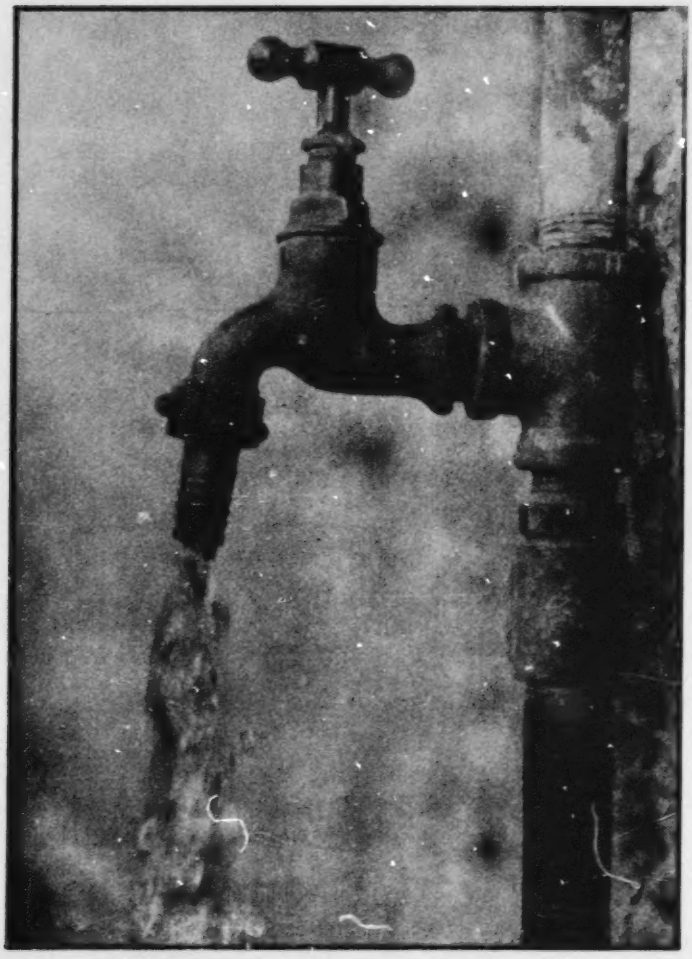
SEYCHELLES INTEGRATED SCIENCE

Unit 3



WATER

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CONTENTS

TOPIC	1	WATER, WATER EVERYWHERE	PAGE 2 - 3
TOPIC	2	USING THE MICROSCOPE	PAGE 4 - 6
TOPIC	3	DRINKING WATER	PAGE 7 - 8
TOPIC	4	SOME SOLUTIONS	PAGE 9 - 10
PROJECT	1	MAKING CRYSTALS	PAGE 11
TOPIC	5	FRESH WATER FROM THE SEA	PAGE 12 - 13
SUMMARY	1	THE WATER CYCLE	PAGE 14
TOPIC	6	SAVING WATER	PAGE 15

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THE MINISTRY OF EDUCATION AND INFORMATION

R E P U B L I C O F S E Y C H E L L E S

515

UNIT 3

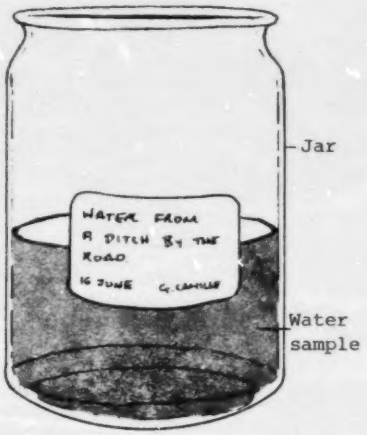
TOPIC 1

WATER, WATER EVERYWHERE

1.0 There is water everywhere around us. Many different things contain water. Make a list in your book of places where you can find water.

Compare your list with your friends'.

1.1 We shall now try to collect small amounts, or samples, of water from some of the places on your list.



To collect a water sample, you will need a clean glass jar. You should put a label on each jar, with your name, where you collect the sample and the date you collect it.

* KEEP YOUR SAMPLES. YOU WILL NEED THEM FOR LATER LESSONS.

1.2 You can now try to find out how the samples are different.

Feel each of them between your finger and thumb.
Smell each sample.
See how clear each sample is, and what colour each one is.

	WATER SAMPLES FROM ...		
	RIVER	DITCH	SEA
FEEL			
SMELL			
COLOUR			
CLEAR ?			

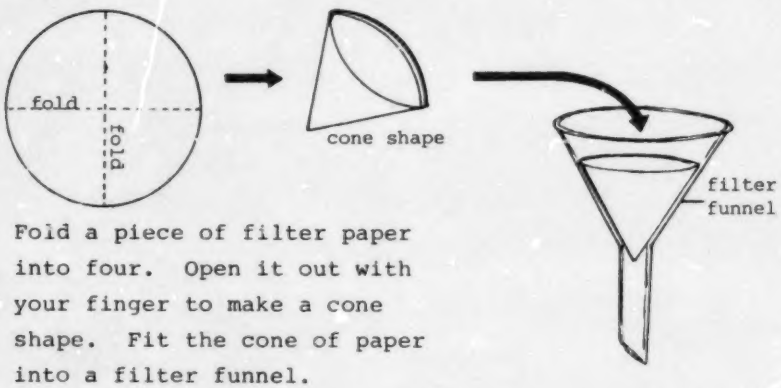
Record your results in a table in your book.

** YOU MUST NOT TASTE THE SAMPLES OF WATER **

Suggest a reason for this.

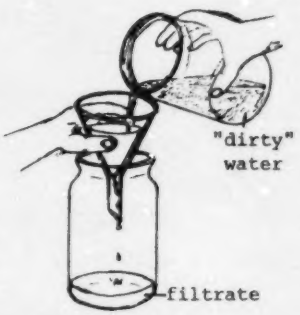
WATER, WATER EVERYWHERE

1.3 Some of your samples of water may look "dirty". You can use some special paper, which we call filter paper, to take out, or separate,dirt from the water.



Fold a piece of filter paper into four. Open it out with your finger to make a cone shape. Fit the cone of paper into a filter funnel.

1.4 Hold the filter funnel over a clean jar or beaker, and pour some river water into it. Do not let the water go higher than the top of the filter paper.
Add more water a little at a time, until you have filtered all of it.



1.5 Compare the water that has come through the filter, ("the filtrate"), with your original river water. Describe any differences you notice between them.

Look at the filter paper. Describe anything that you can see on the paper that has come from the river water. We call this the "residue".

515

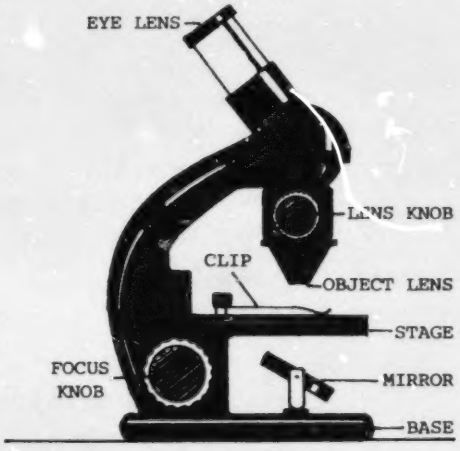
UNIT 3

TOPIC 2

USING THE MICROSCOPE

2.0 In Topic 1, we used our eyes to try to tell "dirty" water from "clean" water. However, there are very tiny bits of dirt in some samples of water which are too small for our eyes to see. We need a special instrument, a MICROSCOPE, to help us to see them.

2.1 Use the drawing (right) to help you to find the different parts of the microscope.



A microscope is fragile and expensive. You must be very careful when you use one.

FOLLOW THE RULES BELOW. THEY TELL YOU HOW TO SET UP THE MICROSCOPE.

1] Put the base down flat on a table. The microscope must be at least 15 cm from the edge of the table. Turn the FOCUS KNOB to move the STAGE right down.

2] Set the LENS KNOB to 75x.

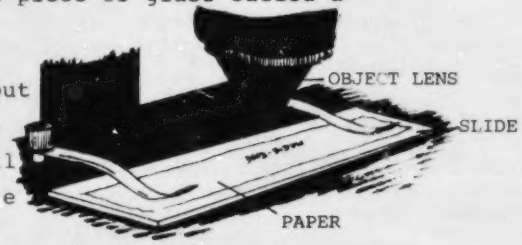
3] Look into the EYE LENS with one eye. (You may like to close your other eye.) Turn the mirror towards the nearest light (the window or an electric light).

4] Move the mirror slowly until you can see a circle of bright light when you look into the eye lens.

********** THE MICROSCOPE IS NOW READY TO USE**********

USING THE MICROSCOPE

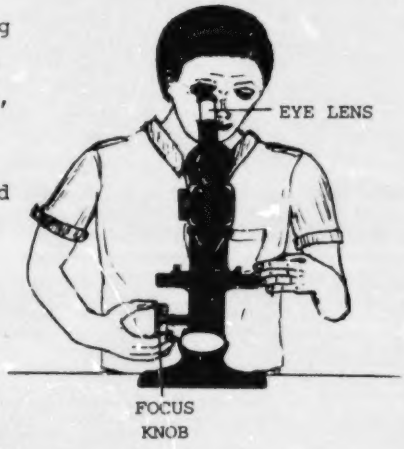
2.2 Normally, we put the thing that we want to look at, (the OBJECT) onto a flat piece of glass called a SLIDE.



Cut a strip of paper about 6 cm long and 1 cm wide. Write your name, as small as you can, in the middle of the paper.

Use the clips to hold the paper and the slide onto the stage. Move the paper carefully so that your name on the paper is under the object lens.

2.3 Look through the EYE LENS. Turn the FOCUS KNOB slowly until you can see the writing on the paper clearly. (When we can see an object clearly, we say it is IN FOCUS.)



Describe what the writing and the paper look like.

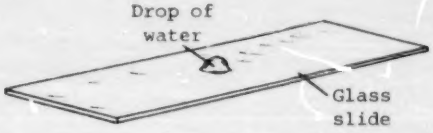
2.4 On another piece of paper, try to write your name so that it appears the right way round when you look at it with the microscope.

Use the microscope to check and see if you have done it correctly.

USING THE MICROSCOPE

2.5 You are now ready to use the microscope to look at your samples of water more closely.

Put one drop of a sample of river water or sea water onto a clean glass slide. Look through the microscope at it.



Describe what you see.

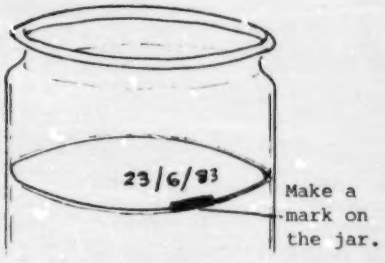
** YOU MUST MAKE SURE THAT THE LENS DOES NOT TOUCH THE WATER **

2.6 In some of the water samples you may see very tiny plants or animals. We call these microbes (or micro-organisms). Look for things that move by themselves. Look for things that have a regular shape. You may see some like the ones in the drawing above.

Some microbes

Draw any that you see. Note the water sample you are looking at next to each drawing.

2.7 Leave all the water samples in their jars in places where you can easily see them. Mark the level of the water on the side of the jar, and note the date.



Leave the jars to stand for several days. Do not move them but record any changes you notice in the water.

515

UNIT 3

TOPIC 3

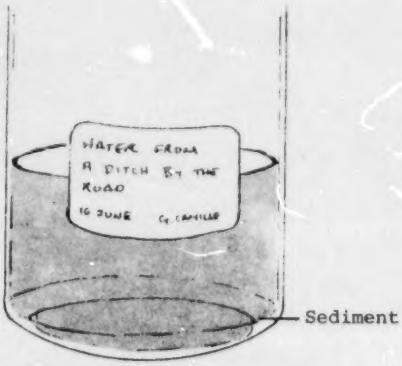
DRINKING WATER

3.0 In Topic 1, you took samples of water from different places. Discuss which, if any, of the samples you would drink. If there are any which you would not like to drink, write down why not in your book.

If you drink "dirty" water, you can catch a disease from the microbes in it. So, before we drink such water we must clean it, or "treat" it. We shall now learn about the way we treat water in Seychelles.

3.1 SETTLING

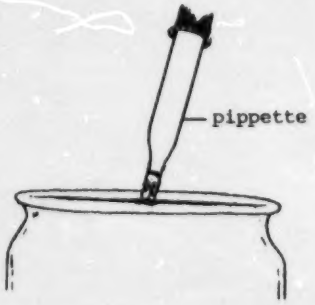
First we must let the water stand in a tank or "reservoir". Some of the dirt in the water falls to, or settles on, the bottom. We call this dirt at the bottom the sediment.



Look at some dirty water which has been left to stand - for example, your samples in 2.7.

Record the colour of any sediment which you can see. Which one of your samples of water has the most sediment ?

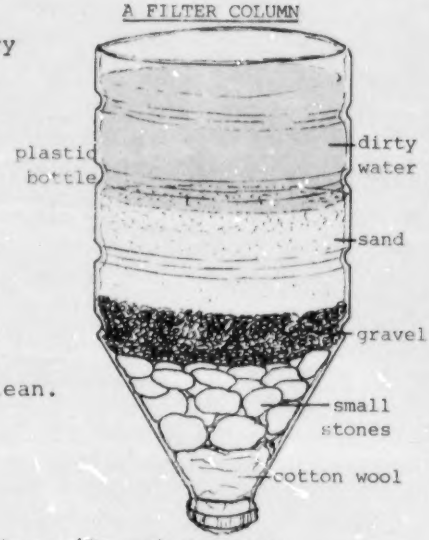
Carefully, take one drop from the water sample that has the most sediment. Put it onto a glass slide. Look at it through the microscope. Do you think it is clean enough to drink yet ? Give a reason for your answer.



3.2 FILTERING

After we have let the water settle, we must filter it to try to remove the very small bits of dirt. In Topic 1, you used paper for filtering. Now we shall use sand as a filter:

A FILTER COLUMN

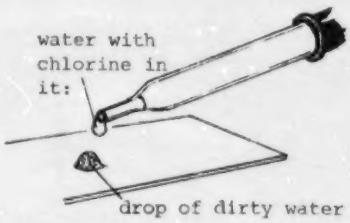


Make a "filter column" like the one in the drawing (right). You will need some cotton wool, some small stones, some gravel, and some sand, which must be clean. Take a plastic bottle. Cut off the bottom of the bottle and use it upside down.

Take another sample of dirty water. (Do not use one of those you have left to stand as you will need these later). Pour the dirty water into the top of your filter column. Describe any differences you observe between the dirty water and the filtrate you collect.

3.3 ADDING CHLORINE

Even after settling and filtering there may still be some microbes in the water. We must kill these before the water is good to drink. We use a chemical called CHLORINE to do this.



Look at a drop of dirty water with some living, moving microbes in it. Add a drop of water with chlorine in it. Use the microscope to watch what happens to the microbes. Describe what you see in your book.

SIS

UNIT 3

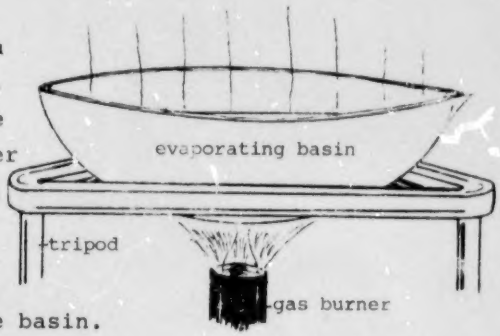
TOPIC 4

SOME SOLUTIONS

4.0 In some places, people cannot get treated water to drink. These people boil their water before they drink it. Why do you think they do this ? (You may like to do an experiment to find out what boiling does to the microbes in the water).

In some places, there may not even be any fresh water. There may only be seawater. Do you think we could make seawater good to drink by boiling it ? Why do you say so ?

4.1 Put a little seawater into a special "evaporating" basin. Make sure it is clean before you start. Heat the seawater in the basin until it boils. Boil it until there is no more water left.



Describe what is left in the basin. What do you think it is ?

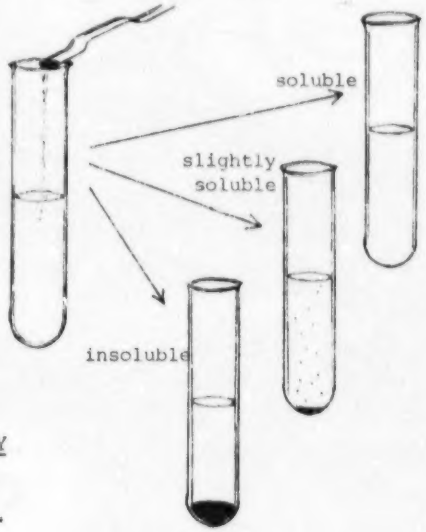
4.2 When the basin is cool, wash it. Repeat the same experiment with water from the tap. Compare your result with that of seawater. Explain why they are different.

4.3 Seawater is not good water for drinking because there is salt in it. We say that the salt was <u>DISSOLVED</u> in the water.
Pour some water into a test-tube until it is half full. Add a little salt with a spatula. Put your thumb over the tube and shake it. Describe what happens to the salt. How could you tell if the water has changed at all ?

SOME SOLUTIONS

4.4 In Topic 4.3, you dissolved salt in water. When something can dissolve in water, we say it is SOLUBLE in water.

Now, you can do some more experiments like the one you did in 4.3. Instead of salt, you can use things like:
sugar, soap, milk powder, chalk, curry powder, sand, coffee powder etc.....



Find out for each if it dissolves easily (SOLUBLE) dissolves a little (SLIGHTLY SOLUBLE), or does not dissolve at all (INSOLUBLE).

Make sure that you use the same amount of each in a test-tube half full of water.

Record your results in a table:

SOLUBLE	SLIGHTLY SOLUBLE	INSOLUBLE

4.5 When you dissolved salt in water, you made what we call a SOLUTION of salt in water. Write down some other things that we can dissolve in water to make a solution.

Discuss how you could find out if something dissolves more in hot water than in cold water. Try out your idea as an experiment. Describe what you do, and record your results.

515

UNIT 3

PROJECT 1

MAKING CRYSTALS

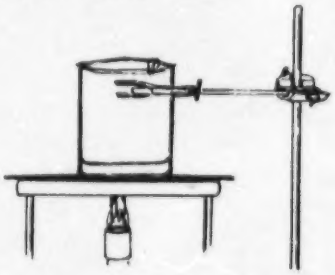
1. Many things can dissolve more easily in hot water than in cold water. We can use this idea to make large pieces of chemicals which have regular shapes. (We call these CRYSTALS).

Pour about 10 ml of water into a small beaker. Use a spatula to add some of a chemical (magnesium sulphate or "Epsom" salt) to the water. Stir the salt until it all dissolves.

Stir the solution to dissolve as much as you can.

Repeat this until you cannot dissolve any more of the salt. (You will be able to see a little at the bottom of the beaker.) This may take a long time.

2. Now heat the beaker <u>gently</u>. Stir the solution to try to dissolve more of the salt. If you need to, add a little more salt so that there is always some which does not dissolve.



3. Repeat this until the solution is hot with a temperature of about 70°C. <u>CAREFULLY</u> pour the hot solution into a special "crystallising" dish. Let the hot solution cool <u>slowly</u>.

A drawing of a crystal

Describe what happens to the salt solution after a few hours. Look at the crystals with a hand lens. Choose the one with the most perfect shape, and draw it in your book.

515

UNIT 3

TOPIC 5

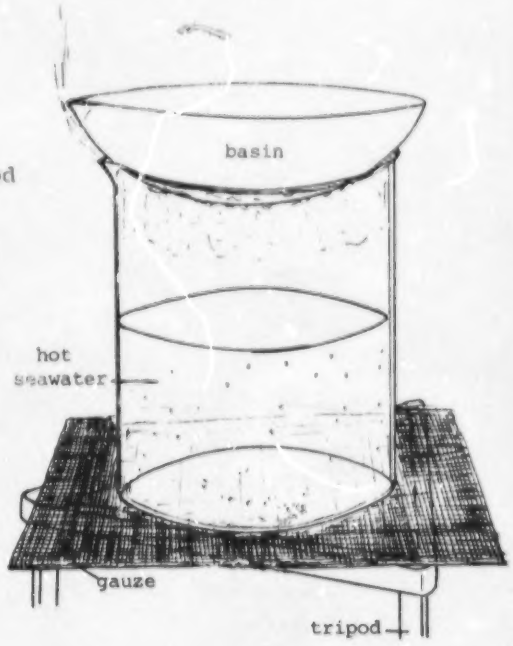
FRESH WATER FROM THE SEA

5.0 People cannot drink water from the sea because of the amount of salt dissolved in it. In Topic 4, you learnt how to get the salt from seawater by using heat to remove the water. Now, we shall try to find out what happens to the water when we heat it.

5.1 Pour some seawater into a glass beaker until it is about half-full. Put the beaker on a gauze on a tripod stand. Heat it until the water boils. Describe what happens to the water as it boils. Turn off the heat.

5.2 Now cover the top of the beaker with a clean dry saucer or small basin.

After about a minute, carefully remove the basin.



Describe what you can see on the under side of the basin. Try to explain where it has come from and how it got there.

Use a small clean beaker to collect some more of this water until you have a few millilitres (ml).

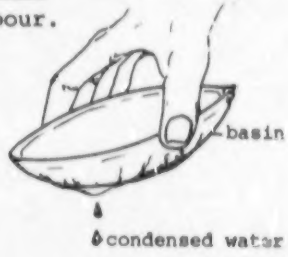
515

UNIT 3

TOPIC 5

FRESH WATER FROM THE SEA

5.3 In experiment 5.1, you heated some seawater. The water changed into vapour, or steam. We say that the water evaporated to form vapour.

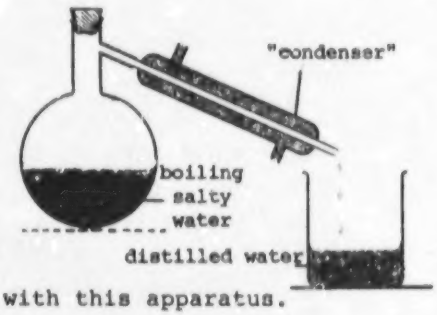


In experiment 5.2, you let some of this vapour cool down on the basin and it changed back into water. We say that the vapour condensed to form water.

Discuss how you could find out if the condensed water still has salt dissolved in it. Describe what you do, and record your results.

5.4 You have now learnt how to make fresh water from seawater. We call this process (evaporating and then condensing) DISTILLATION. Discuss how distillation could be important for people living on hot, dry coral islands where there is very little rain.

5.5 Your teacher may show you a larger apparatus which we use for distillation. Watch what happens when we try to distil water using this apparatus.



Describe what you observe. Try to explain how we are able to make distilled water with this apparatus.

5.6 Try to find out some of the things that we use distilled water for, and make a list of them in your book.

515

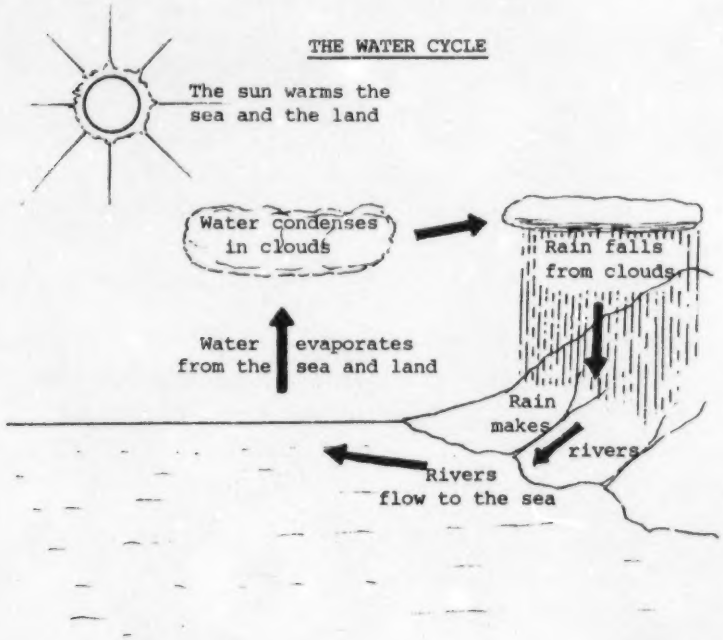
UNIT 3

SUMMARY 1

THE WATER CYCLE

1. In Topic 5, we learnt that we can make fresh water from seawater by distillation. Water vapour evaporates from the hot seawater. This vapour condenses when it is cooler to form fresh water.

   Look at the picture below. It shows how clouds and rain form in Nature.


THE WATER CYCLE
The sun warms the sea and the land
Water condenses in clouds
Rain falls from clouds
Water evaporates from the sea and land
Rain makes rivers
Rivers flow to the sea

2. We call this the WATER CYCLE because the water goes round and round like the wheel of a bicycle - from land to sea; from sea to air and from air back to land again.
   Write down some ways in which the water cycle is like your distillation experiment in Topic 5. Write down some ways in which it is different.

515

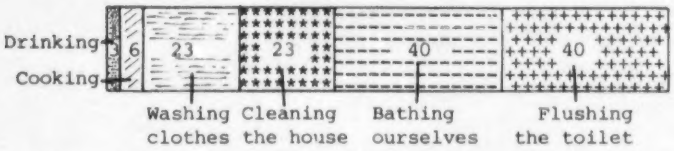
UNIT 3

TOPIC 6

SAVING WATER

6.0 Every day we use water for many different things. In your book, make a list of the different ways that you use water every day.

6.1 Look at the chart below. It shows how much water we use for different things: (with numbers of litres)



What do we use the largest amount of water for ?

Suggest some ways of saving water in the dry season so that we use less every day.

Design a picture for a poster with the title:
** SAVE WATER **

6.2 Many houses in Seychelles have a supply of treated water. It costs money to treat the water, and to make water pipes, so we must pay for the water that we use. Every month, the Water Authority counts the number of units of water that we have used with a meter. Then they send an "account" showing how much we have to pay:

METER READINGS		UNITS USED		EACH UNIT COSTS		COST OF UNITS USED
PRESENT	PREVIOUS					
46	36	10	x	1 Rupee	=	10 Rs.
(For the month: May)						

Look at the "account" above. If we use 8 units in June, what will the reading on the meter be then ? Each unit has a volume of 1,000 litres. What is the volume of 8 units of water ?

INDEX OF NEW WORDS	PAGE NUMBER
Account	15
Chlorine	8
Clip	4
Condense	13
Crystallising dish	11
Crystals	11
Dissolved	9
Distillation	11
Distilled water	13
Epsom salt	11
Evaporate	12
Evaporating basin	9
Eye lens	4
Filter	3
Filter column	8
Filter funnel	3
Filter paper	3
Filtrate	3
Focus	5
Focus knob	4
Hand lens	11
Insoluble	10
Lens knob	4
Magnesium sulphate	11
Meter	15
Microbes	6
Micro-organisms	6
Microscope	4
Object	5
Object lens	4
Residue	3
Sample	2
Sediment	7
Settling	7
Slide	5
Soluble	10
Solution	10
Stage	4
Steam	13
Treat	7
Units (of water)	15
Vapour	13

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